**Objectives**

Upon completion of this activity, you will be able to:

* Describe how energy drives movement and change in the hydrosphere and atmosphere. You should also be able to predict circulation in the atmosphere and hydrosphere may change due to global warming.

**Causal Principles**

1. Gravitational energy, thermal energy and/or chemical **energy** drive all movement and change of matter on Earth.

3. Matter moves and changes to return a system to **equilibrium.**

1. **Temperature** is a measure of the movement of molecules. Higher temperature means molecules are moving faster.
2. When molecules move faster, the **density** of most substances decreases. Water is an anomaly because liquid water is more dense than ice.
3. **Buoyancy** causes materials to rise or fall due to the relative density of materials.

**PART 1: Background Notes**

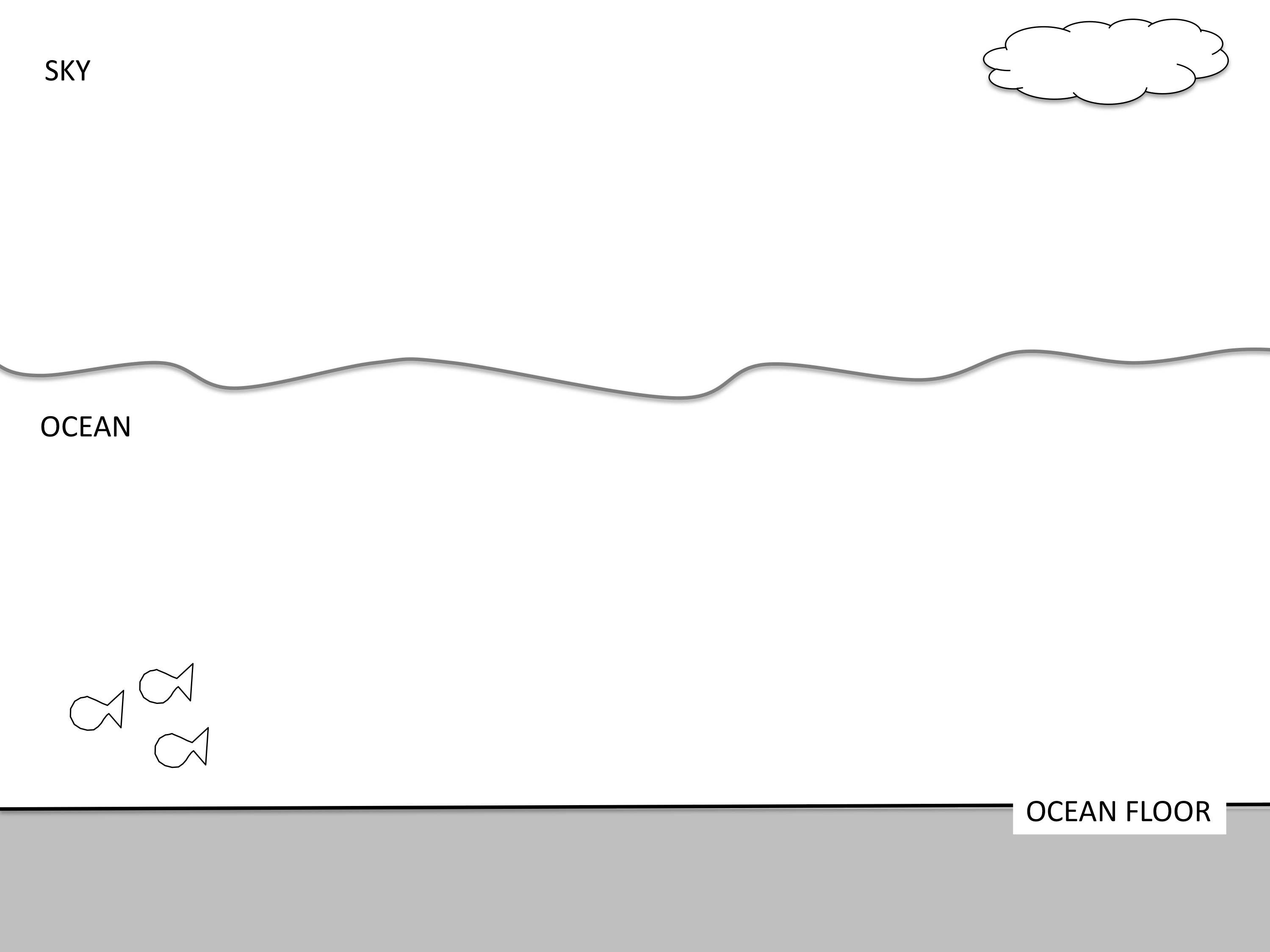
Describe below a) how temperature affects the density of air and water and

b) how salinity affects the density of water:

**Part 2: Group Work**

A. Label features as discussed in class.

B. Follow the same procedure to examine thermohaline circulation. On the diagram, label features such as: warm water, cold water, salty water, and freshwater, and draw arrows to indicate processes.



Look back at the causal principles listed at the beginning of this activity. Label, with corresponding numbers, where processes related to the causal principles are occurring.

Questions:

1. What causes the differences in density in the atmosphere?
2. Where is the energy source in the atmosphere?
3. What causes the differences in density in the oceans?
4. Where is the energy source in oceans?

**Part 3: Homework**

If you complete the group work, you may work on the homework **on your own.** This means your answers should be generally unique from other students’ answers. **Submit your homework using ANGEL**.

**True or False**:

1. Ocean circulation transfers heat to the polar regions of Earth.

*TRUE FALSE (circle one)*

Explain your reasoning for this answer:

2. During ocean circulation, warm water rises in the equatorial regions of Earth.

*TRUE FALSE (circle one)*

Explain your reasoning for this answer:

**Short Answer**

3. What factors can cause the circulation of air and/or water?

4. How might global warming impact the circulation of fluids? You may come up with multiple correct responses to this question.